MATH 103 200710 Problem Set 7

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The following problems may appear on the quiz on Tuesday, April 10, 2007.

1. Find the derivatives of the following exponential functions using the chain rule (and other rules you may need):

   (a) $1+4x+e^{-2x}$ (b) $(e^{-3x}-2x)^4$ (c) $e^t(e^{2t}-e^{-2t})$ (d) $4x^2/(x^2+e^{2x})$

2. Solve the following equations for x:

   (a) $e^{1-3x}=4$ (b) $\ln x^2=9$ (c) $e^{\sqrt{x}}=\sqrt{e^x}$ (d) $(e^x)^2\cdot e^{2-3x}=4$

3. Find the derivatives of the following logarithmic functions using the chain rule (and other rules you may need):

   (a) $\ln(e^x+e^{-x})$ (b) $(1+\ln x)^3$ (c) $1/\ln x$ (d) $\sqrt{\ln 2x}$

4. Find the derivatives of the following logarithmic functions by first simplifying using the properties of the natural logarithm function:

   (a) $\ln[(x+1)(2x-1)(4-3x)]$ (b) $\ln[(1+x)^3(2+x)(3+x)^2]$ (c) $\ln[x^5e^{4x}\sqrt{3x+1}/(1-x^2)]$

5. Find the values of x at which the following functions have stationary points, and use the second derivative test to find the nature of the stationary points:

   (a) $(1-x)e^{2x}$ (b) $(4x-1)/e^{x/2}$ (c) $e^{-x}+3x$ (d) $x/(\ln x+x)$

6. The value of a computer t years after purchase is $v(t)=2000e^{-0.35t}$ dollars. At what rate is the computer's value falling after 3 years?

7. Use logarithmic differentiation to differentiate the following functions:

   (a) $e^x(3x-4)^8$ (b) $x^3(x-3)^4/(x+4)^4$ (c) 10^x (d) $x^{1/x}$

8. Suppose that the total revenue function for a manufacturer is $R(x)=300\ln(x+1)$, and the cost function is $C(x)=2x$. Find the value of x at which profit is maximized.

9. Suppose the demand function for a certain commodity is $p=45/\ln x$. Determine the marginal revenue function for this commodity and compute the marginal revenue when $x=20$. Is there a production level x at which revenue is maximized? If so, find it.

Please do the following problems from the textbook. They may appear on the final exam.

4.3 C-level: 1–32; B-level: 33–34, 41–45; A-level: 46–48.

4.4 C-level: 1–38; B-level: 39–44; A-level: 47–48.

4.5 C-level: 1–25; B-level: 26–32; A-level: 33–36.

4.6 C-level: 1–30; B-level: 31–48; A-level: 53–54.